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A checklist of phytoplankton genera for Nelson River and Rat-Burntwood Lakes, 1980, 1981 and 1986

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ABSTRACT

During the summers of 1980 and 1981, phytoplankton samples were collected from Cross Lake, Manitoba, and in the summer of 1986, phytoplankton samples were collected from Cross, Pipestone, Rat, Sipiwesk, Split, Stephens and Threepoint lakes. Emphasis was placed on the identification to genera and the occurrence of the major algal species.

In the samples collected in 1986, the dominant taxonomic group was Diatomeae. The secondary taxon was Cyanophyceae, which differed from the 1980, 1981 samples where Chlorophyceae were secondary in importance. In 1980, the dominant genus was Pediastrum. This changed, in 1986, to Melosira spp., Asterionella from Diatomeae, Anabaena, Aphanizomenon from Cyanophyceae, or a combination of the four.

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INTRODUCTION

Part of the data presented in this report was collected in the summers of 1980 and 1981 in association with a fisheries study on Cross Lake (Gaboury and Patalas, 1980).

The 1986 data were compiled in conjunction with an ecological monitoring program under the auspices of Claim #18 of the Northern Flood Agreement. This monitoring, included the collection of phytoplankton samples from Rat, Threepoint, Cross, Sipiwesk, Split and Stephens lakes. Rat and Threepoint lakes, on the immediate Churchill River diversion route, are referred to as the diversion lakes. Cross and Sipiwesk, situated at the upper reaches of the Nelson River, are referred to as the Upper Nelson. Split and Stephens lakes, situated near the lower region of the Nelson River, are referred to as the Lower Nelson.

This study was initiated to assess the impact of the Churchill River diversion on the fish ecology of the northern lakes. It is useful that all the monitored lakes have background information documented so that future comparisons can be made.

This report is of a preliminary nature, confined only to reporting the qualitative (not quantitative) occurrence of phytoplankton found in Cross, Pipestone, Rat, Sipiwesk, Stephens and Threepoint lakes.

The main objectives of this report are:

1. to list the occurrence of algal groups, and

2. to identify the dominant, common and present genera.

This report functions only to provide baseline information on the algae composition of the aforementioned lakes and is not concerned with the interpretation of results.

METHODS AND MATERIALS

Sampling methods for plankton collected from Cross Lake in 1980 and 1981 were described in Gaboury and Patalas (1981).

In 1986, plankton samples were collected from all stations during early, middle and late summer. A Wisconsin plankton net with an opening diameter of 25 cm and a mesh size of 73μ was used. Two hauls were made at each station. One was used for phytoplankton identification, and the other for zooplankton identification, biomass estimates and dry weight determinations. Samples were preserved in a 5% buffered formalin solution.

The Utermohl or inverted microscope method (1958, cited in Edmondson and Winberg, 1971) was used for phytoplankton analysis. Field samples were poured into thin glass bottomed counting chambers and set aside to settle for approximately 24 h. The counting chambers held a fixed volume of 2 ml. The algae were identified using an inverted microscope. A few drops of Lugol's solution were added to the chambers in order to stain the phytoplankton. This allowed for easier identification of algae.

The sample was first scanned at a lower power (10x) to estimate the occurrence of the algal orders in relation to one another. Each order present was alloted to one of four categories; dominant, common, present, and rare. The dominant taxon represented approximately 70% of the sample, the common taxon approximately 24%, the present taxon

approximately 5%, and the rare taxon approximately 1% of the sample.

At a higher magnification (40x), the phytoplankters were identified to the generic level. These were also categorized from dominant to rare, depending on their relative abundance.

The species list and pictorial reference to the phytoplankton of central and northern Canada - Part I and II, by D. Findlay and H. Kling (1979), were used as a reference.

RESULTS

In all the lakes sampled, the dominant taxa generally included the greatest diversity of genera as well as the dominant genus. There are exceptions to this. For example, in Table 2, the dominant genus at Cross Lake Stn. 6 on July 10th is Mougotia, which does not belong to Diatomeae, the dominant order. Also, two or more genera from the same order or from different orders may be co-dominant. An example of this is Threepoint Lake (Table 9) where Melosira spp. and Asterionella both from the same order are co-dominant. On the same table, at Stn. 1, August 19, Anabaena and Asterionella, both from two different orders, are co-dominant.

In the 1980, and especially 1981, Cross Lake samples, the dominant order was generally Diatomeae. Chlorophyceae was the secondary order. Overall, the most abundant genus in 1980 was Pediastrum, with a shift towards Melosira spp. and Asterionella in 1981. In comparison, the Cross Lake data from 1986 (Table 3), indicate the dominant order was again Diatomeae, but Cyanophyceae, not Chlorophyceae, was the secondary order. The dominant genera were either Melosira spp., Asterionella from Diatomeae, Anabaena, Aphanizomenon from Cyanophyceae or a combination of the four.

For all the lakes sampled in 1986, the dominant order was Diatomeae. The secondary order was Cyanophyceae. The dominant and secondary genera were generally either one of, or a combination of,

Melosira spp., Asterionella, Anabaena and Aphanizomenon.

Note that Anabaena and Aphanizomenon from the order Cyanophyceae were present in all the lakes, but tended to be the secondary if not dominant genera in at least five of the lakes (Tables 3, 5, 6, 7 & 9) during the August sampling period.

It is interesting to note that in the lakes sampled in 1986, Pediastrum was present or rare, but never dominant as in 1980.

In all the lakes, Peridineae, Cryptophyceae and Euglenophyceae made up a small proportion of the sample composition. Peridinium were generally more abundant than cryptophytes and euglenophytes were observed only in Cross Lake in 1980 and in 1986.

A list of orders and of various genera found in each group are in Appendix 1.

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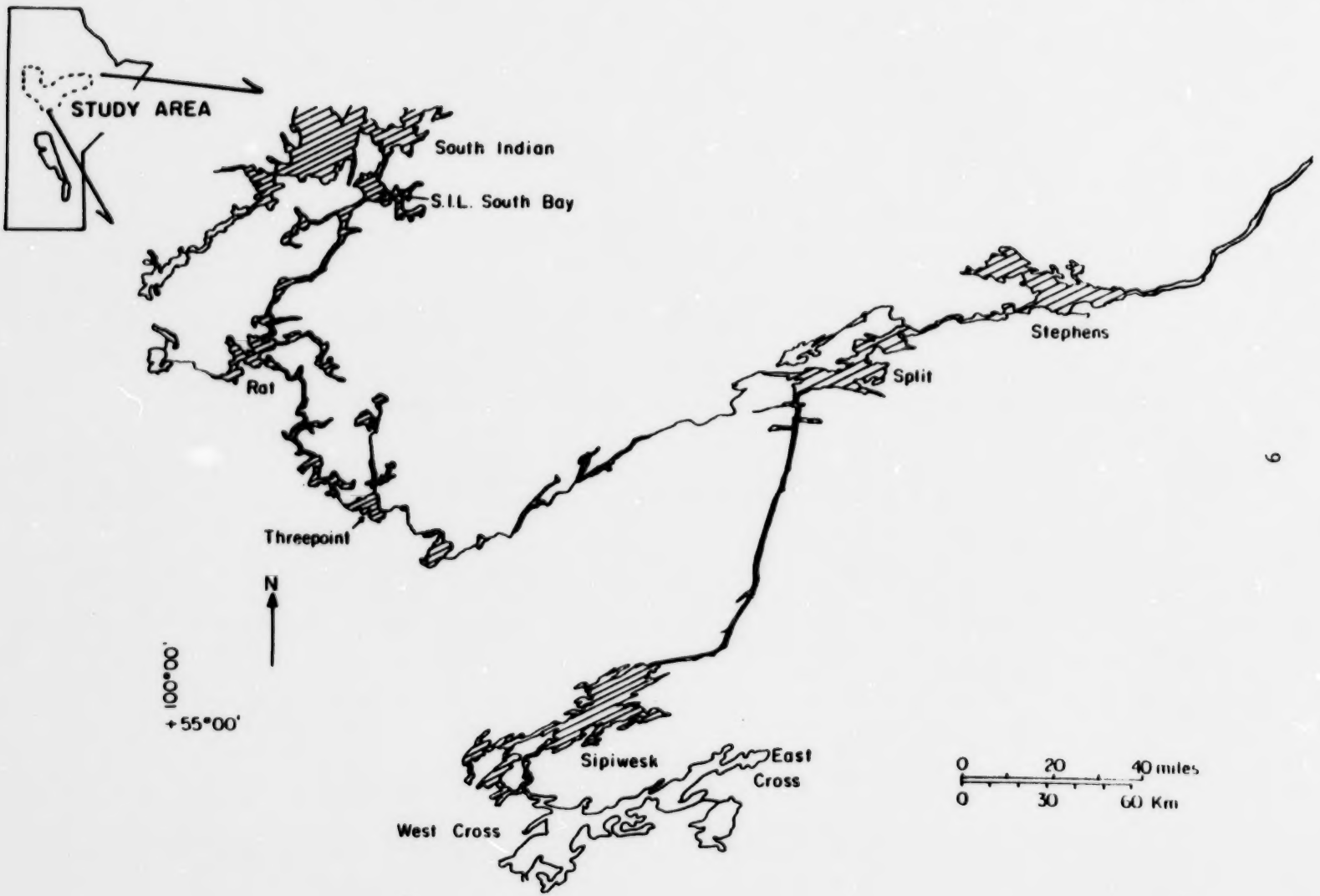

Fig. 1. Location of the six lakes sampled for phytoplankton, 1986.

Table 1. Occurrence of phytoplankton groups from Cross Lake, Manitoba, 1980. (1 = dominant; 2 = common; 3 = present; 4 = rare). Underlining denotes importance of genera; solid line 70%; broken line ≈24%, no underline 5%.

Station No.	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Diatomeae	Cryptophyceae	Peridineae	Euglenophyceae	COMMON GENERA
2	July 1	3	2	4	1	-	-	-	Pediastrum, Melosira spp., Synedra, Anabaena, Aphanothece, Gomphosphaeria, Merismopedia
4	July 2	3	2	4	1	4	-	-	Asterionella, Fragilaria spp., Anabaena, Pediastrum, Melosira spp., Aphanizomenon, Staurastrum
6	July 2	4	2	4	1	4	-	-	Asterionella, Melosira spp., Spirogyra, Mougotia, Fragilaria spp., Penate diatoms, Synedra
2	July 29+	4	2	3	4	-	3	-	Pediastrum, Uroglena, Gymnodinium, Aphanothece, Gloeococcus, Penate diatoms
4	July 29+	3	1	4	2	4	4	-	Pediastrum, Ankistrodesmus, Planctonema, Staurastrum spp., Asterionella, Melosira spp., Chroococcus
6	July 31	4	1	4	4	-	4	-	Mougotia, Spirogyra
4	Aug. 27	3	2	-	1	-	4	4	Aphanizomenon, Pediastrum, Melosira spp., Synedra, Asterionella, Fragilaria spp., Anabaena
6	Aug. 27	4	3	4	1	-	4	-	Melosira spp., Closterium, Dinobryon spp., Asterionella, Synedra, Tabellaria
2	Sept. 25	3	1	4	2	-	-	-	Pediastrum, Fragilaria spp., Melosira spp., Cosmarium, Staurastrum spp.
4	Sept. 25	4	2	4	1	-	-	-	Asterionella, Fragilaria spp., Closterium, Anabaena, Cosmarium, Pediastrum, Staurastrum
6	Oct. 1	4	2	-	1	-	-	-	Melosira spp., Asterionella spp., Lyngbya, Ankistrodesmus, Monoraphidium, Penate diatoms

- order not present
+ detritus present

Table 2. Occurrence of phytoplankton groups from Cross Lake, Manitoba, 1981. (1 = dominant; 2 = common; 3 = present; 4 = rare). Underlining denotes importance of genera; solid line 70%; broken line ≈24%, no underline 5%.

Station No.	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Diatomeae	Cryptophyceae	Peridineae	Euglenophyceae	COMMON GENERA
2+	June 8	3	2	4	1	-	-	-	Pediastrum, Fragilaria spp., Melosira spp., Chroococcus, Scenedesmus, Staurastrum, Dinobryon spp.
4+	June 8	3	1	3	2	-	4	-	Pediastrum, Staurastrum, Dinobryon spp., Anabaena, Chroococcus, Fragilaria spp., Melosira spp.
6	June 10	4	3	3	1	-	-	-	Melosira spp., Dinobryon spp., Asterionella, Anabaena, Ankistrodesmus, Pediastrum
2+	July 7	3	2	-	1	-	4	-	Asterionella, Pediastrum, Fragilaria spp., Melosira spp., Anabaena, Gloecoccus, Staurastrum
4+	July 7	3	2	-	1	4	-	-	Asterionella, Melosira spp., Anabaena Fragilaria spp., Closterium, Pediastrum, Monoraphidium
6	July 10	3	2	4	1	-	4	-	Mougotia, Melosira spp., Anabaena Pediastrum, Spirogyra, Asterionella, Penate diatoms
2*	Aug. 9	3	2	4	1	-	4	-	Fragilaria, Pediastrum, Melosira spp., Staurastrum spp., Penate diatoms, Synedra
4	Aug. 9	2	3	4	1	4	4	-	Lyngbya, Melosira spp., Synedra, Anabaena, Fragilaria, Gyrosigma, Penate diatoms
6*	Aug. 10	4	2	4	1	-	-	-	Melosira spp., Mougotia, Pediastrum, Asterionella sp., Penate diatoms
2	Sept. 12	2	1	-	3	-	4	-	Lyngbya, Pediastrum, Scenedesmus, Fragilaria spp., Melosira spp., Gymnodinium
4	Sept. 12	3	2	3	1	-	-	-	Melosira spp., Dinobryon spp., Anabaena, Lyngbya, Ankistrodesmus, Closterium, Pediastrum, Asterionella spp.,
6	Sept. 12	2	3	4	1	-	4	-	Melosira spp., Lyngbya, Anabaena, Ankistrodesmus, Asterionella spp., Penate diatoms

- Order not present
+ Detritus present
* Sparse sample

Table 3. Occurrence of phytoplankton groups from Cross Lake, Manitoba, 1986. (1 = dominant; 2 = common; 3 = present; 4 = rare). Underlining denotes importance of genera; solid line 70%; broken line ≈24%, no underline 5%.

Station No.	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Diatomeae	Cryptophyceae	Peridineae	Euglenophyceae	COMMON GENERA
1	June 9	3	3	2	1	-	4	-	Dinobryon, Asterionella, Lyngbya, Closterium, Fragilaria, Melosira spp.,
2		2	2	2	1	4	-	-	Dinobryon spp., Anphanizomenon, Chlamydomonas, Asterionella, Anabaena, Closterium, Melosira spp.,
3		4	2	3	1	3	-	-	Asterionella, Chlamydomonas, Cryptomonas, Fragilaria spp., Melosira spp., Closterium, Pediastrum spp., Dinobryon spp.
1	July 8	4	3	-	1	-	-	-	Melosira spp., Asterionella, Fragilaria spp., Pediastrum, Synedra
2		4	3	-	1	-	-	-	Melosira spp., Asterionella
3		2	3	4	1	4	-	-	Melosira spp., Anabaena, Pediastrum, Fragilaria, Synedra, Scenedesmus
1	Aug. 18	1	3	3	1	4	4	-	Aphanizomenon, Melosira spp., Ankistrodesmus, Pediastrum, Asterionella spp.
2		2	3	4	1	-	4	4	Tabellaria, Anabaena, Fragilaria spp., Melosira spp., Synedra, Gomphosphaeria, Pediastrum, Asterionella
3		2	3	4	1	4	4	-	Tabellaria, Anabaena, Fragilaria, Synedra, Microcystis, Dictyosphaerium, Pediastrum, Melosira spp.

- Order not present

Table 4. Occurrence of phytoplankton groups from Pipestone Lake, Manitoba, 1986. (1 = dominant; 2 = common; 3 = present; 4 = rare). Underlining denotes importance of genera; solid line 70%; broken line ≈24%, no underline 5%.

Station No.	Date		Cyanophyceae	Chlorophyceae	Chrysophyceae	Diatomeae	Cryptophyceae	Peridineae	Euglenophyceae	COMMON GENERA
1	Oct.	2	3	3	4	1	-	-	-	Melosira spp, Fragilaria, Lyngbya, Ankistrodesmus, Pediastrum, Asterionella spp.,

- Order not present

Table 5. Occurrence of phytoplankton groups from Rat Lake, Manitoba, 1986. (1 = dominant; 2 = common; 3 = present; 4 = rare). Underlining denotes importance of genera; solid line 70%; broken line ≈24%, no underline 5%.

Station No.	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Diatomeae	Cryptophyceae	Peridineae	Euglenophyceae	COMMON GENERA
1	June 9	3	4	4	1	4	-	-	Asterionella, Melosira spp.,
2		3	4	3	1	-	-	-	Asterionella spp., Melosira spp., Anabaena, Aphanizomenon, Synura, Tabellaria
3		4	4	4	1	4	4	-	Asterionella spp., Melosira spp.
1	July 8	3	4	3	1	4	4	-	Melosira spp., Asterionella, Anabaena, Dinobryon spp., Fragilaria, Tabellaria
2		3	4	3	1	-	-	-	Melosira spp., Dinobryon, Asterionella, Anabaena, Tabellaria
3		3	4	-	1	4	4	-	Melosira spp., Asterionella, Anabaena, Aphanizomenon
1	Aug. 18	1	3	3	2	-	2	-	Anabaena spp., Aphanizomenon, Ceratium, Asterionella, Synura, Fragilaria, Melosira spp,
2		1	3	3	1		4	-	Anabaena spp., Aphanizomenon, Asterionella, Fragilaria, Gloeococcus, Dinobryon spp., Salpingoeca, Ceratium, Melosira spp.,
3		1	4	3	1	-	4	-	Anabaena spp., Aphanizomenon, Asterionella, Dinobryon spp., Synura, Ceratium, Fragilaria

- order not present.

Table 6. Occurrence of phytoplankton groups from Sipiwesk Lake, Manitoba, 1986. (1 = dominant; 2 = common; 3 = present; 4 = rare). Underlining denotes importance of genera; solid line 70%; broken line 24%, no underline 5%.

Station No.	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Diatomeae	Cryptophyceae	Peridineae	Euglenophyceae	COMMON GENERA
1	June 9	1	4	2	3	4	-	-	Oscillatoria, Dinobryon spp., Ankistrodesmus, Asterionella spp.
2		3	3	4	1	-	-	-	Melosira spp., Asterionella spp., Anabaena, Aphanizomenon, Ankistrodesmus, Dinobryon spp., Penate diatoms
3		3	3	2	1	-	4	-	Asterionella spp., Melosira spp., Dinobryon spp., Fragilaria spp., Anabaena, Aphanizomenon, Pediastrum, Penate diatom
1	July 8	4	4	4	1	-	3	-	Asterionella, Anabaena, Ceratium, Cymbella, Fragilaria, Penate diatoms
2		4	3	-	1	-	-	-	Melosira spp., Asterionella, Fragilaria spp., Pediastrum
3		4	4	-	1	-	4	-	Melosira spp., Fragilaria spp., Anabaena, Asterionella, Surirella
1	Aug. 19	1	2	-	3	-	-	-	Aphanizomenon, Chlorophyte colony, Eudorina, Melosira spp.,
2		3	3	4	1	-	4	-	Melosira spp., Asterionella spp., Aphanizomenon, Chlorophyte colony, Pediastrum, Fragilaria, Surirella
3		3	3	4	1	-	4	-	Melosira spp., Asterionella spp., Aphanizomenon, Pediastrum, Fragilaria spp.,

- order not present.

Table 7. Occurrence of phytoplankton groups from Split Lake, Manitoba, 1986. (1 = dominant; 2 = common; 3 = present; 4 = rare). Underlining denotes importance of genera; solid line 70%; broken line ~24%, no underline 5%.

Station No.	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Diatomeae	Cryptophyceae	Peridineae	Euglenophyceae	COMMON GENERA
1	June 10	4	3	4	1	-	-	-	Melosira spp., Asterionella, Fragilaria spp., Tabellaria, Pediastrum, Dinobryon
2		4	4	4	1	4	-	-	Melosira spp., Asterionella, Fragilaria spp., Tabellaria, Dinobryon, Penate diatoms
3		4	-	4	1	-	-	-	Melosira spp., Asterionella, Fragilaria spp., Stephanodiscus
1	July 7	4	4	4	1	-	-	-	Melosira spp., Asterionella, Anabaena, Fragilaria spp.
2		4	3	4	1	-	-	4	Melosira spp., Asterionella, Anabaena, Pediastrum, Salpingoeca, Fragilaria spp.
3		2	3	4	1	-	-	-	Melosira spp., Asterionella, Anabaena, Pediastrum spp., Salpingoeca, Fragilaria spp., Penate diatoms, Tabellaria
1	Aug. 18	2	4	4	1	-	3	-	Melosira spp., Anabaena spp., Ceratium, Asterionella, Fragilaria spp., Pediastrum
2		2	3	4	1	-	4	-	Melosira spp., Anabaena, Asterionella, Fragilaria spp., Pediastrum, Ceratium, Synedra
3		2	4	-	1	-	4	-	Melosira spp., Anabaena, Fragilaria, Pediastrum, Ceratium, Asterionella

- order not present

Table 8. Occurrence of phytoplankton groups from Stephens Lake, Manitoba. 1986. (1 = dominant; 2 = common; 3 = present; 4 = rare). Underlining denotes importance of genera; solid line 70%; broken line ≈24%, no underline 5%.

Station No.	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Diatomeae	Cryptophyceae	Peridineae	Euglenophyceae	COMMON GENERA
1	June 10	2	3	4	1	-	-	-	Melosira spp, Aphanizomenon, Asterionella spp., Anabaena, Dinobryon spp., Fragilaria spp., Penate diatoms
2		4	4	4	1	-	-	-	Melosira spp., Asterionella, Fragilaria spp., Dinobryon spp., Stephanodiscus, Tabellaria
3		-	3	4	1	-	-	-	Melosira spp., Asterionella, Fragilaria, Tabellaria, Dinobryon spp., Stephanodiscus
1	July 7	3	4	4	1	-	4	-	Melosira spp., Asterionella, Fragilaria spp., Anabaena, Tabellaria
2		3	4	4	1	-	-	-	Melosira spp., Asterionella, Anabaena, Salpingoeca, Fragilaria spp.,
3		1	4	2	2	4	-	-	Dinobryon spp., Anehanizomenon, Asterionella spp., Anabaena, Lyngbya,
1	Aug. 10	2	4	4	1	-	4	-	Anabaena spp., Asterionella, Ceratium
2		-	4	4	1	-	4	-	Melosira spp., Asterionella
3		4	3	-	1	-	-	-	Melosira spp., Asterionella, Fragilaria, Stephanodiscus

- order not present

Table 9. Occurrence of phytoplankton groups from Threepoint Lake, Manitoba, 1986. (1 = dominant; 2 = common; 3 = present; 4 = rare). Underlining denotes importance of genera; solid line 70%; broken line ≈24%, no underline 5%.

Station No.	Date	Cyanophyceae	Chlorophyceae	Chrysophyceae	Diatomeae	Cryptophyceae	Peridineae	Euglenophyceae	COMMON GENERA
1	June 10	4	4	4	1	-	-	-	Melosira spp., Asterionella
2	4	4	4	1	-	-	4	-	Melosira spp., Asterionella, Fragilaria spp., Synedra, Stephanodiscus
3	4	4	4	4	1	-	-	-	Melosira spp., Asterionella, Fragilaria spp., Stephanodiscus, Tabellaria
1	July 8	4	4	4	1	-	4	-	Melosira spp., Asterionella, Stephanodiscus
2		4	4	4	1	-	4	-	Melosira spp., Asterionella, Fragilaria spp.
3		4	4	-	1	-	4	-	Melosira spp., Asterionella
1	Aug. 19	2	3	2	1	4	4	-	Aphanizomenon, Melosira spp., Eudorina, Synura, Asterionella, Dinobryon spp., Salpingoeca, Fragilaria spp., Tabellaria
2+		1	4	4	3	-	-	-	Aphanizomenon, Synura, Chlorophyte colony, Fragilaria
3		2	3	2	1	4	4	-	Aphanizomenon, Synura, Asterionella, Fragilaria spp., Melosira spp., Anabaena, Eudorina, Dinobryon spp., Salpingoeca, Penate diatoms, Synedra

- order not present
+ detritus present

APPENDICES

Appendix 1. List of algae genera found in all the lakes sampled.

Order	Cyanophyceae	Chlorophyceae	Chrysophyceae	Cryptophyceae	Diatomeae	Peridineae	Euglenophyceae
Genera	Anabaena spp.	Ankistrodesmus	Bicoeca	Cryptomonas	Achnathese	Ceratium	Trachelomonas
	Aphanizomenon	Ankrya	Botryococcus	Katablepharis	Asterionella sp.	Peridinium	
	Aphanothece	Chlamydomonas	Chrysophyte colony	Pyramidomonas	Asterionella spp.	Gymnodinium	
	Chroococcus	Chlamydomonas colony	Dinobryon sp.	Rhodomonas	Cyclic diatom		
	Cyanophyte colony	Chlorophyte colony	Dinobryon spp.		Cyclotella		
	Gomphosphaeria	Chlorophyte?	Mallomonas		Cymbella		
	Lyngbya	Chodatella	Salpingoeca		Eunotia		
	Merismopedia	Closterium	Stelexmonas		Fragilaria sp.		
	Microcystis	Cosmarium	Synura		Fragilaria spp.		
	Oscillatoria	Crucigenia	Unknown		Gomphonema		
		Dictyosphaerium	Uroglena		Gyrosigma		
		Dispora			Melosira spp.		
		Elakatothrix			Penate diatoms		
		Eudorina			Rhizosolenia		
		Gloeococcus			Stephanodiscus		
		Kirchneriella			Synedra		
		Lagerheimia			Surirella		
		Monoraphidium			Tabellaria		
		Mougotia					
		Oocystis					
		Pediastrum					
		Planctonema					
		Scenedesmus					
		Spirogyra					
		Spondylosium					
		Staurastrum sp.					
		Staurastrum spp.					
		c.f. volvex					